

What is claimed is:

- 1 1. A spray data acquisition system comprising:
2 a housing for supporting a pumping device whereby the pumping device is
3 responsive to an applied force to generate an aerosol spray plume through an exit port
4 thereon along a spray axis;
5 a spray pump actuator, wherein the spray pump actuator is capable of controlling
6 a pumping force and a duration of the aerosol spray plume of the pumping device;
7 an illumination device for illuminating the aerosol spray plume along at least one
8 geometric plane that intersects the aerosol spray plume; and,
9 an imaging device for acquiring data representative of a first interaction between
10 the illumination and the aerosol spray plume along the at least one geometric plane.
- 1 2. An apparatus for producing image data representative of at least one sequential set
2 of images of a spray plume, each of the images being representative of a density
3 characteristic of the spray plume (i) along a geometric plane that intersects the spray
4 plume, and (ii) at a predetermined instant in time, comprising:
5 an illuminator for providing an illumination of the spray plume along at least one
6 geometric plane that intersects the spray plume; and,
7 a transducer for generating the image data representative of an interaction between
8 the illumination and the spray plume along the at least one geometric plane.
- 1 3. An apparatus according to claim 2, wherein the sequential set of images is
2 representative of a progression in time.

1 4. An apparatus according to claim 2, wherein a first time-sequential set of images
2 corresponds to an axial cross-sectional density characteristic along a first geometric plane
3 substantially normal to a flow direction centerline, and a second time-sequential set of
4 images corresponds to a longitudinal density characteristic along a second geometric
5 plane substantially parallel to and intersecting the flow direction centerline.

1 5. An apparatus according to claim 2, wherein the interaction between the
2 illumination and the spray plume includes optical scattering.

1 6. An apparatus according to claim 2, wherein the interaction between the
2 illumination and the spray plume includes optical absorption.

1 7. An apparatus according to claim 2, wherein the transducer includes a digital
2 imaging system for generating and recording the image data

1 8. An apparatus according to claim 7, wherein the digital imaging system includes
2 an image sampling rate of approximately 500 images per second.

1 9. An apparatus according to claim 2, wherein the illuminator includes a laser
2 system having a fan-shaped output pattern.

1 10. An apparatus according to claim 9, wherein the fan-shaped output pattern includes
2 a fan angle of approximately 45 degrees, and a laser line thickness of approximately one
3 millimeter at approximately the centerline of the emitted spray.

1 11. An apparatus according to claim 9, wherein the laser system includes a 4 watt,
2 810 nm laser output.

1 12. A spray data acquisition system according to claim 1, wherein the illumination
2 device illuminates the spray plume along a second geometric plane that intersects the
3 aerosol spray plume, and the imaging device acquires data representative of a second
4 interaction between the illumination and the aerosol spray plume along a second
5 geometric plane.

1 13. A spray data acquisition system according to claim 12 wherein the first and the
2 second geometric planes are substantially orthogonal.